

SAMSUNG

ELECTRONICS

Approval

Customer : GA**DATE : 02.Dec.2009****SAMSUNG TFT-LCD****MODEL : LTA260AP08-W**Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's Approval

SIGNATURE

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02.Dec.2009

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LCD Business

Samsung Electronics Co . , LTD.

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*** Revision History**

Date	Rev. No	Page	Summary
02.Dec . 2009	000	all	First issued

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General Description

Description

LTA260AP08 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 26" is 1366 x 768 and this model can display up to 16.7 millions colors.

Features

- High contrast ratio, high aperture structure
- PVA (Patterned Vertical Align) mode
- Wide Viewing Angle
- High speed response
- HD (1366 x 768 pixels) resolution
- Low power consumption
- U type 4CCFLs (Cold Cathode Fluorescent Lamp)
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface (1pixel/clock)
- RoHS compliance (Pb-free)

Applications

- Workstation & desktop monitors
- Display terminals for AV application products
- Monitors for industrial machine

* If the module is used to other applications besides the above, please contact SEC in advance.

General Information

Items	Specification	Unit	Note
Module Size	626 (H _{typ}) × 373 (V _{typ})	mm	± 1.0 mm
	53 (D _{max})		
Weight	4,200 (typ.)	g	
Pixel Pitch	0.4215 (H) × 0.1405 (V)	mm	
Active Display Area	575.769 (H) × 323.712 (V))	mm	
Surface Treatment	Haze 7%, Hard-Coating (3H)		
Display Colors	8 Bits, 16.7M	colors	
Number of Pixels	1,366 x 768	pixel	
Pixel Arrangement	RGB Horizontal stripe		
Display Mode	Normally Black		
Luminance of White	400(Typ.)	cd/m ²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

(VSS = 0 V)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	10.8	13.2	V	(1)
Storage temperature	T_{STG}	-20	65	°C	(2)
Center of Glass Surface temperature (Operation)	T_{SUR}	0	65	°C	(2)
Operation temperature	T_{OPR}	0	50	°C	(2)
Shock (non - operating)	S_{nop}	-	50	G	(3)
Vibration (non - operating)	V_{nop}	-	1.5	G	(4)

Note (1) $T_a = 25 \pm 2$ °C

(2) Temperature and relative humidity range are shown in the figure below.

a. 90 % RH Max. ($T_a \leq 39$ °C)

b. Relative Humidity is 90% or less. ($T_a > 39$ °C)

c. No condensation

(3) 11ms, sine wave, one time for $\pm X$, $\pm Y$, $\pm Z$ axis

(4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

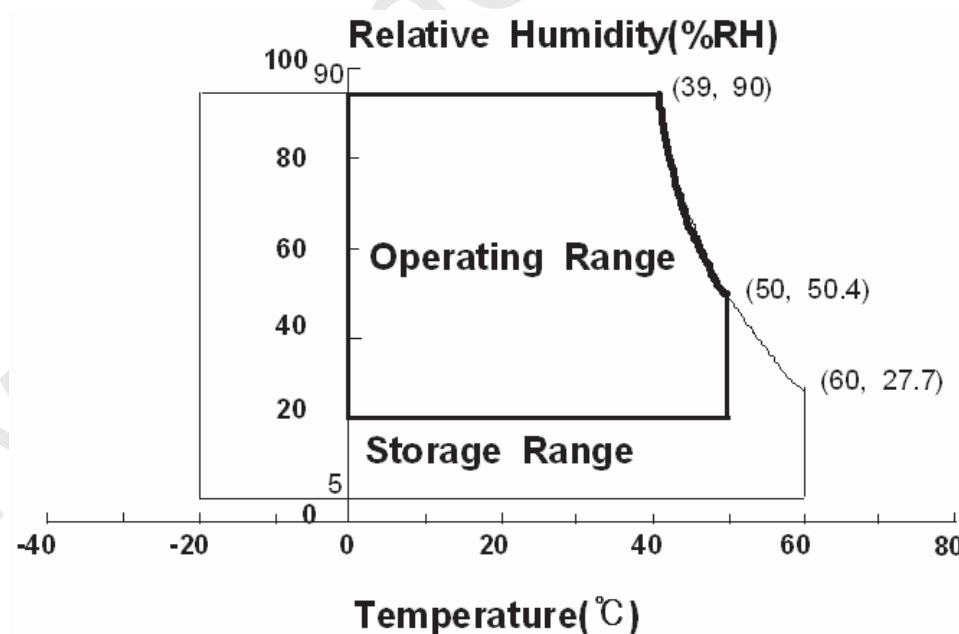


Fig. Temperature and Relative humidity range

2. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.

Measuring equipment : TOPCON RD-80S, TOPCON SR-3, ELDIM EZ-CONTRAST

(Ta = 25 ± 2 °C, VDD=12V, fv= 60Hz, fdCLK=78 MHz, INVERTER = 57.5 (KHz ± 2.5Khz), DUTY 100%)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		-	5000	-		(1) SR-3
Response Time	G-to-G	Tg	Normal $\theta_{\mathbf{L,R}}=0$ $\theta_{\mathbf{U,D}}=0$ Viewing Angle	-	8	16	ms	
Luminance of White (Center of screen)		Y _L		350	400	-	cd/m ²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.640	TYP. +0.03		(5),(6) SR-3
		Ry			0.340			
	Green	Gx			0.300			
		Gy			0.600			
	Blue	Bx			0.150			
		By			0.060			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72.0	-	%	(5) SR-3
Color Temperature		-		-	10,000	-	K	(5) SR-3
Viewing Angle	Hor.	θ_{L}	C/R≥10	79	89	-	Degree	(6) EZ-Contrast
		θ_{R}		79	89	-		
	Ver.	θ_{U}		79	89	-		
		θ_{D}		79	89	-		
Brightness Uniformity (9 Points)		B _{uni}		-	-	25	%	(2) SR-3

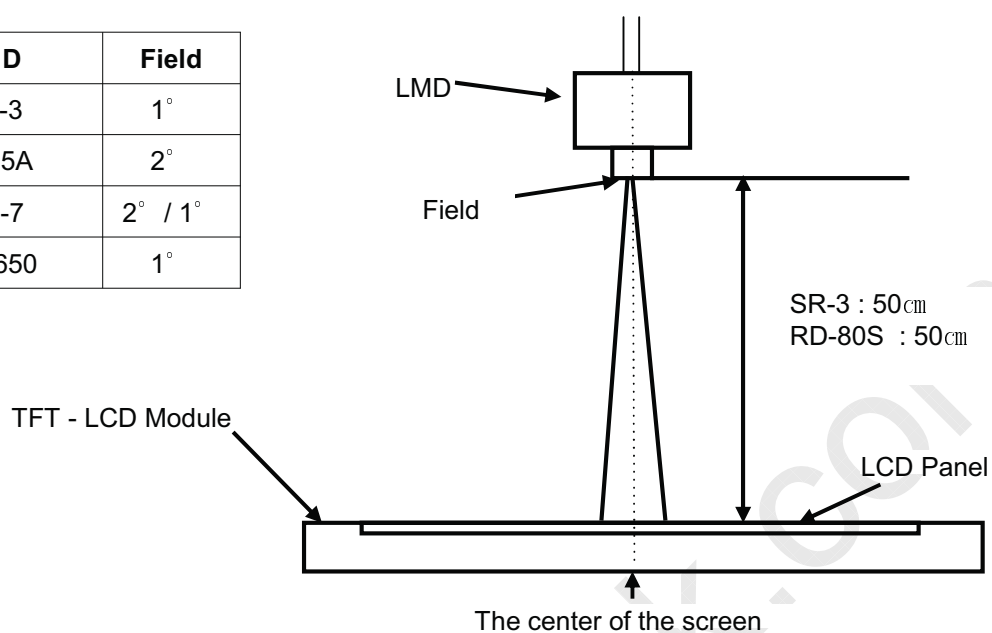
- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room 60min after lighting the back light at the given temperature for stabilization of the back light.
This should be measured in the center of screen.

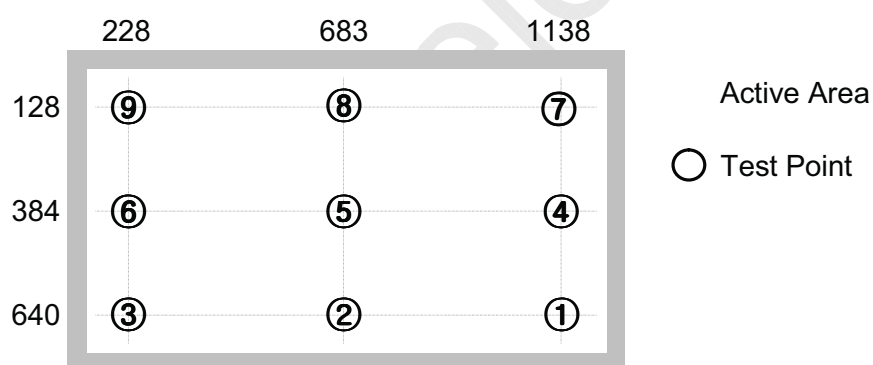
Environment condition : Ta = 25 ± 2 °C

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LMD	Field
SR-3	1°
BM-5A	2°
BM-7	2° / 1°
PR-650	1°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G_{\max}}{G_{\min}}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

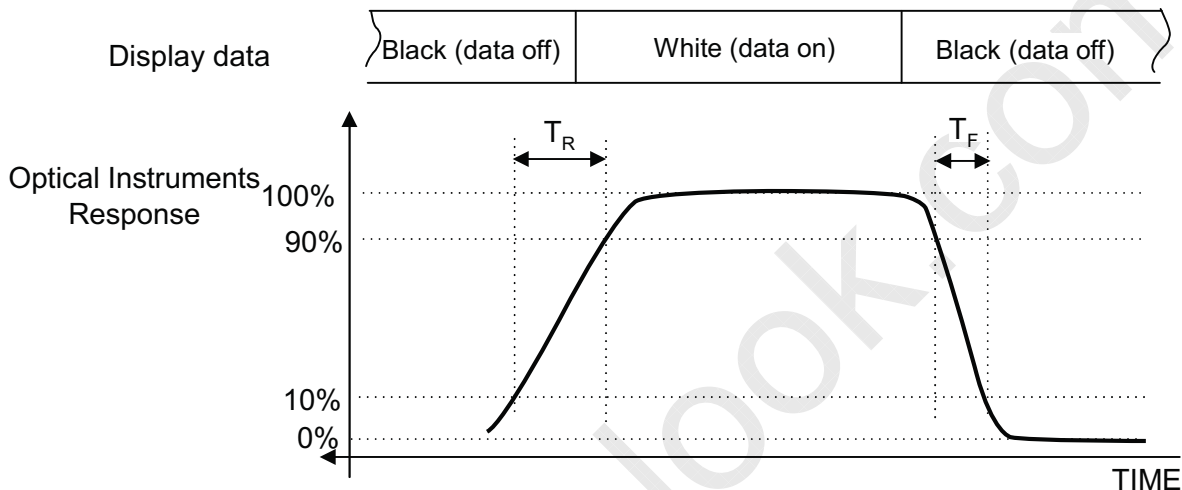
Note (2) Definition of 9 points brightness uniformity (Test Pattern : Full White)

$$B_{uni} = 100 * \frac{(B_{max} - B_{min})}{B_{max}}$$

Bmax : Maximum brightness

Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf



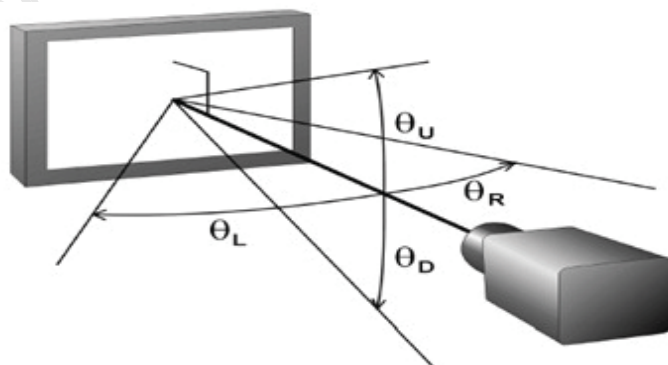
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle

: Viewing angle range (C/R ≥ 10)



3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

Ta = 25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply	V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	250	450	650	mA	(2),(3), (5)
	(b) White	250	450	650	mA	
	(c) V-Stripe	500	700	900	mA	
Vsync Frequency	f_V	48	60	66	Hz	
Hsync Frequency	f_H	44	48	53	kHz	
Main Frequency	f_{DCLK}	72	78	85	MHz	
Rush Current	I_{RUSH}	-	-	4.0	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD} .

(2) $f_V=60\text{Hz}$, $f_{DCLK} = 78\text{ MHz}$, $V_{CC} = 12\text{V}$, DC Current.

(3) Power dissipation check pattern (LCD Module only)

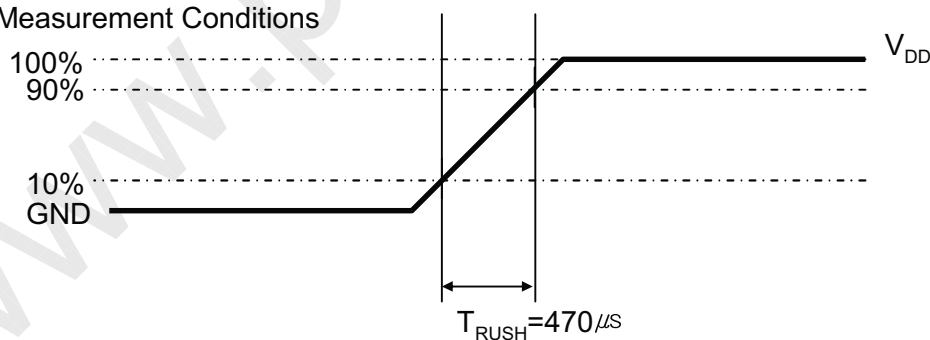
a) Black Pattern

b) White Pattern

c) V-Stripe



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is $470\mu\text{s}$.

(5) The current of the inverter is not included.

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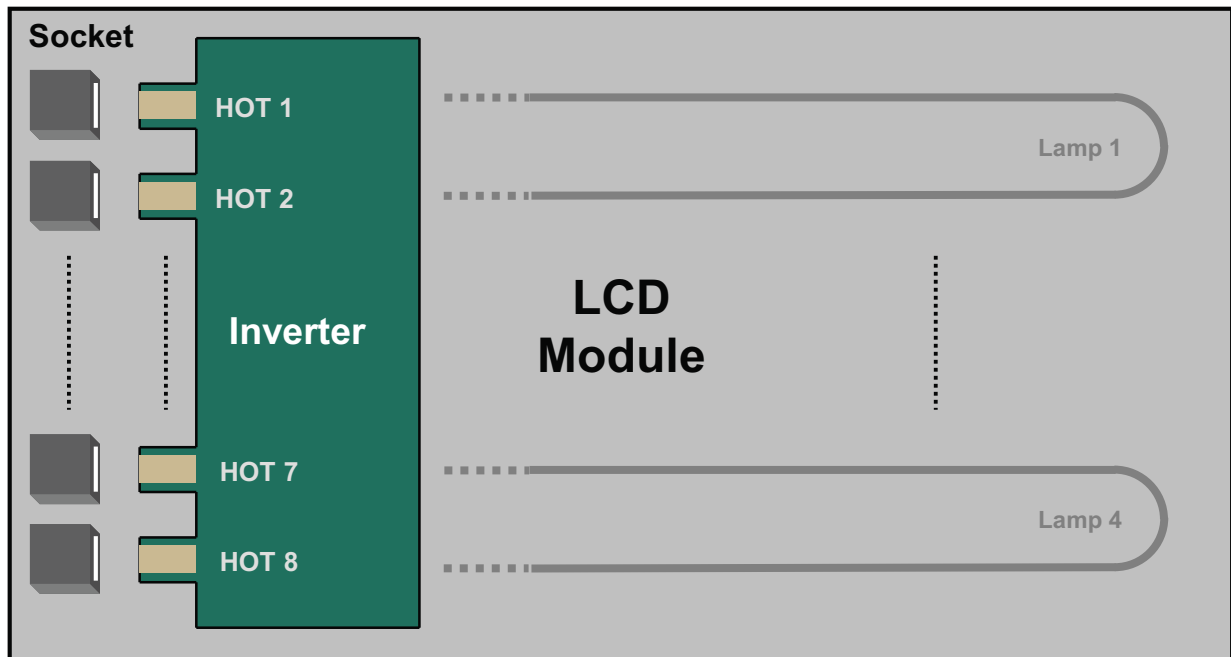
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3.2 Back Light Unit

The back light unit contains 4 U-type CCFLs (Cold Cathode Fluorescent Lamp).

$T_a = 25 \pm 2^\circ\text{C}$



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp Voltage	V_L	-	1230	1430	Vrms	
Operating Life Time	Hr	50,000	-	-	Hour	(1)
Startup Voltage	V_s	-	-	$0^\circ\text{C} : 2,120$	Vrms	

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : $T_a = 25 \pm 2^\circ\text{C}$, For single lamp only.]

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3.3 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	22.5	25	27.5	Vdc	Ta=25± 2 °C
Input Current	Iin	Vin=24.0V Vdim=3.3V Ta=25 °C		-	3.55	A	(1)
							(2)
Frequency	F _{LAMP}	Vin=24.0 V	61	63	65	kHz	-
Backlight On/Off	ON	Vin=24.0 V	2.4	-	5.25	Vdc	-
	OFF	Vin=24.0 V	0	-	0.8		-
External PWM Dimming Control	V _{High}		2.4		5.25	Vdc	(3),(4)
	V _{Low}		0		0.8		
	F _{EXT.PWM}	Vin=24, Dim=100%	156	166	176	Hz	
	D _{pwm}		15	-	100	%	

Note) Power Consumption is measured when 450[cd/m²] of luminance which is the typical luminance.

Lamp Current is measured at the point before Lamp.

(1) Max Value of the Power Consumption is measured during initial turn-on time* of the backlight.

(2) Max Value of the Power Consumption is measured after 60 min warm-up.

(3) When EX-DIM(Pin 14) is used, DIM(Pin13) has to be open or connected to ground.

(4) EX-PWM Frequency is selected not to interfere the Waterfall & Acoustic Noise.

* Initial turn-on time : From 0sec to 60min after turn-on

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(2) Lamp frequency which may produce interference with horizontal synchronous frequency may cause line flow on the display. Therefore lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) is defined as the time when brightness of a lamp unit itself becomes 50% or less than its original value at the condition of $T_a = 25 \pm 2^\circ\text{C}$ and $I_L = 6.5 \text{ mArms}$

(4) Designing a system inverter intended to have better display performance, power efficiency and lamp reliability.

They would help increase the lamp lifetime and reduce leakage current.

- The measurement should be done at typical lamp current.
- The asymmetry rate of the inverter waveform should be less than 10%.
- The distortion rate of the waveform should be $\sqrt{2}$ with $\pm 10\%$ tolerance.
 - Inverter output waveform had better be more similar to ideal sine wave.

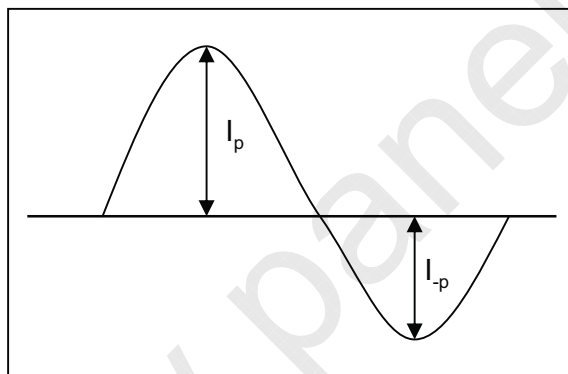


Fig. Wave form of the inverter

- Asymmetry rate

$$\frac{|I_p - I_{-p}|}{I_{rms}} \times 100$$

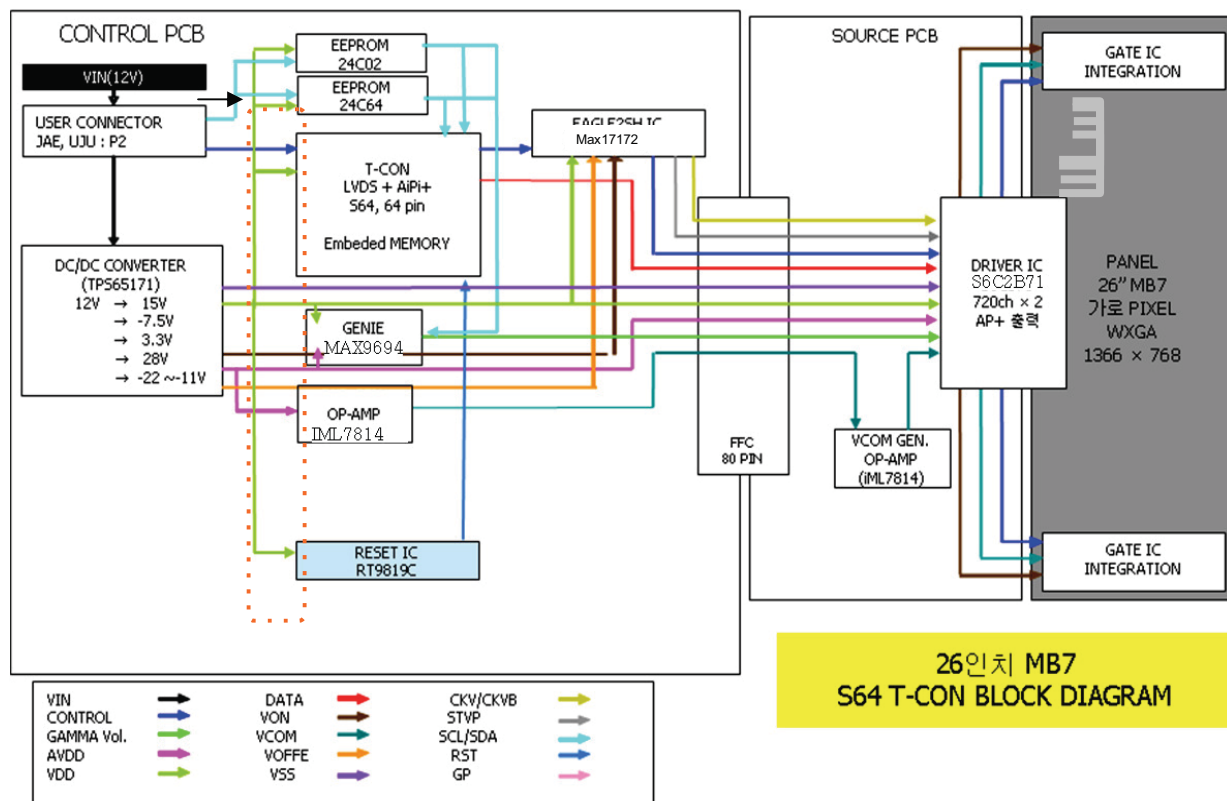
- Distortion rate

$$\left| \frac{I_p}{I_{rms}} \right| \text{ or } \left| \frac{I_{-p}}{I_{rms}} \right|$$

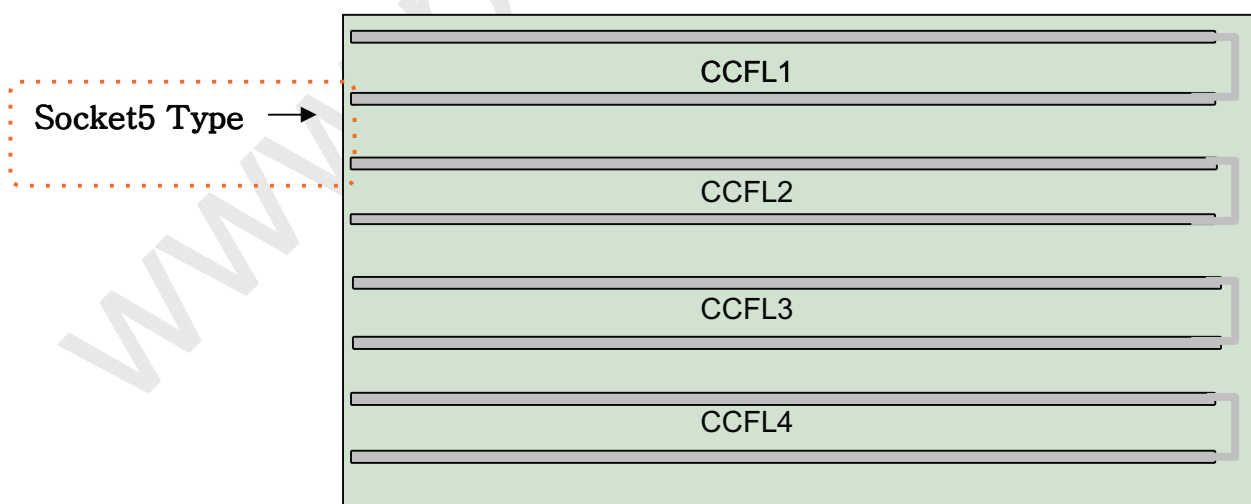
(5) If an inverter has shutdown function, it should keep its output for over 1 second even if the lamp connector is open. Otherwise the lamps may not be turned on.

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Back Light Unit



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5. Input Terminal Pin Assignment

5.1. Input Signal & Power (Connector : 196260-30041 → P-TWO)

PIN NO	SYMBOL	FUNCTION
1	NC	No Connection
2	NC	No Connection
3	NC	No Connection
4	GND	Power Ground
5	RXIN0-	Negative LVDS Differential Data Input (0)
6	RXIN0+	Positive LVDS Differential Data Input (0)
7	GND	Power Ground
8	RXIN1-	Negative LVDS Differential Data Input (1)
9	RXIN1+	Positive LVDS Differential Data Input (1)
10	GND	Power Ground
11	RXIN2-	Negative LVDS Differential Data Input (2)
12	RXIN2+	Positive LVDS Differential Data Input (2)
13	GND	Power Ground
14	RXCLKIN-	Negative LVDS Differential Clock Input (Clock)
15	RXCLKIN+	Positive LVDS Differential Clock Input (Clock)
16	GND	Power Ground
17	RXIN3-	Negative LVDS Differential Data Input (3)
18	RXIN3+	Positive LVDS Differential Data Input (3)
19	GND	Power Ground
20	NC	No Connection
21	LVDS_SEL	LVDS Option
22	NC	No Connection
23	GND	Power Ground
24	GND	Power Ground
25	GND	Power Ground
26	VCC	Power Supply : +12V
27	VCC	
28	VCC	
29	VCC	
30	VCC	

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Note) Pin number starts from Left side

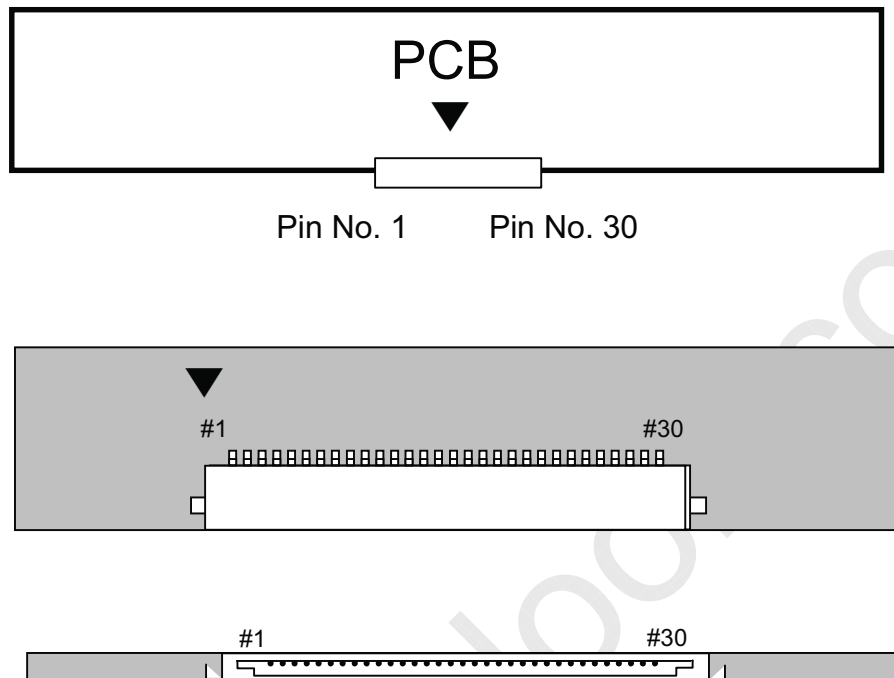


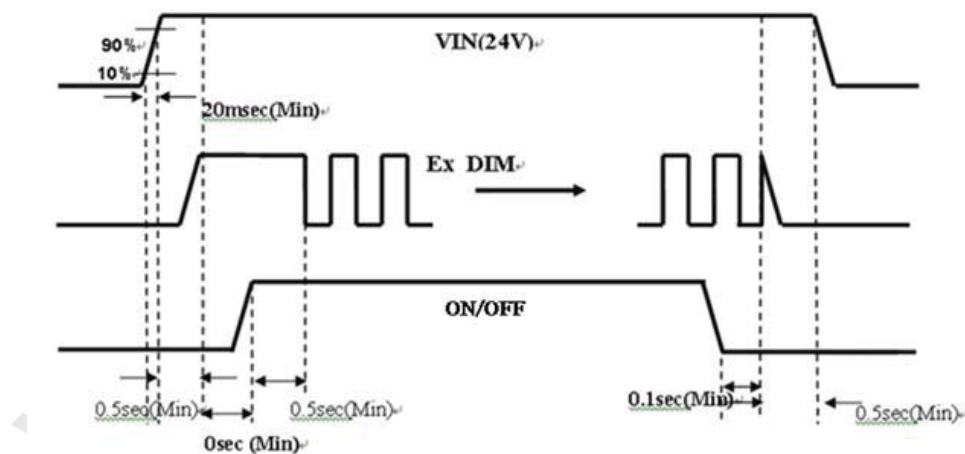
Fig. Connector diagram

- a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
- b. All power input pins should be connected together.
- c. All NC pins should be separated from other signal or power.
- d. LVDS Option: If this pin → Low (GND) : JEIDA LVDS Format
→ High(3.3V) : Normal NS LVDS Format
- f. Sequence: Power On → Vdd(12V) > LVDS option > interface signal
Power Off → Interface signal > LVDS option > Vdd(12V)

5.2. Inverter input pin configuration (Connector : 20022WR-14AML→ Yeon-HO)

PIN NO	SYMBOL	FUNCTION
1	Vin	Power Supply(25V)
2	Vin	
3	Vin	
4	Vin	
5	Vin	
6	GND	Ground
7	GND	
8	GND	
9	GND	
10	GND	
11	Error out	Error out (Normal: GND, Abnormal: open collector)
12	ENA	Enable (Backlight on ~ off)
13	NC	Not use
14	Ext. Dim	External PWM dimming signal(Pulse)

5.3. Inverter Input Power Sequence



Note) SEQUENCE : On = Vin(25V) > Dimming Control ≥ Backlight On/off
OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

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5.2 LVDS Interface

	LVDS pin	JEIDA DATA	NORMAL DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	REVERSED	RESERVED

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5.3 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																										GRAY SCALE LEVEL
		RED								GREEN								BLUE										
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7			
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-		
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-		
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-		
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-		
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-		
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-		
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-		
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0		
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1		
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R3~ R252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:					
	↓ LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R252	
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R252	
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R252	
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0		
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1	
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2	
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G3~ G252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:					
	↓ LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G252	
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G252	
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G252	
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0		
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B1	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B2	
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B3~ B252		
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:					
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	B252	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B252	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B252	

Note (1) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

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6. Interface Timing

6.1 Timing Parameters (DE only mode)

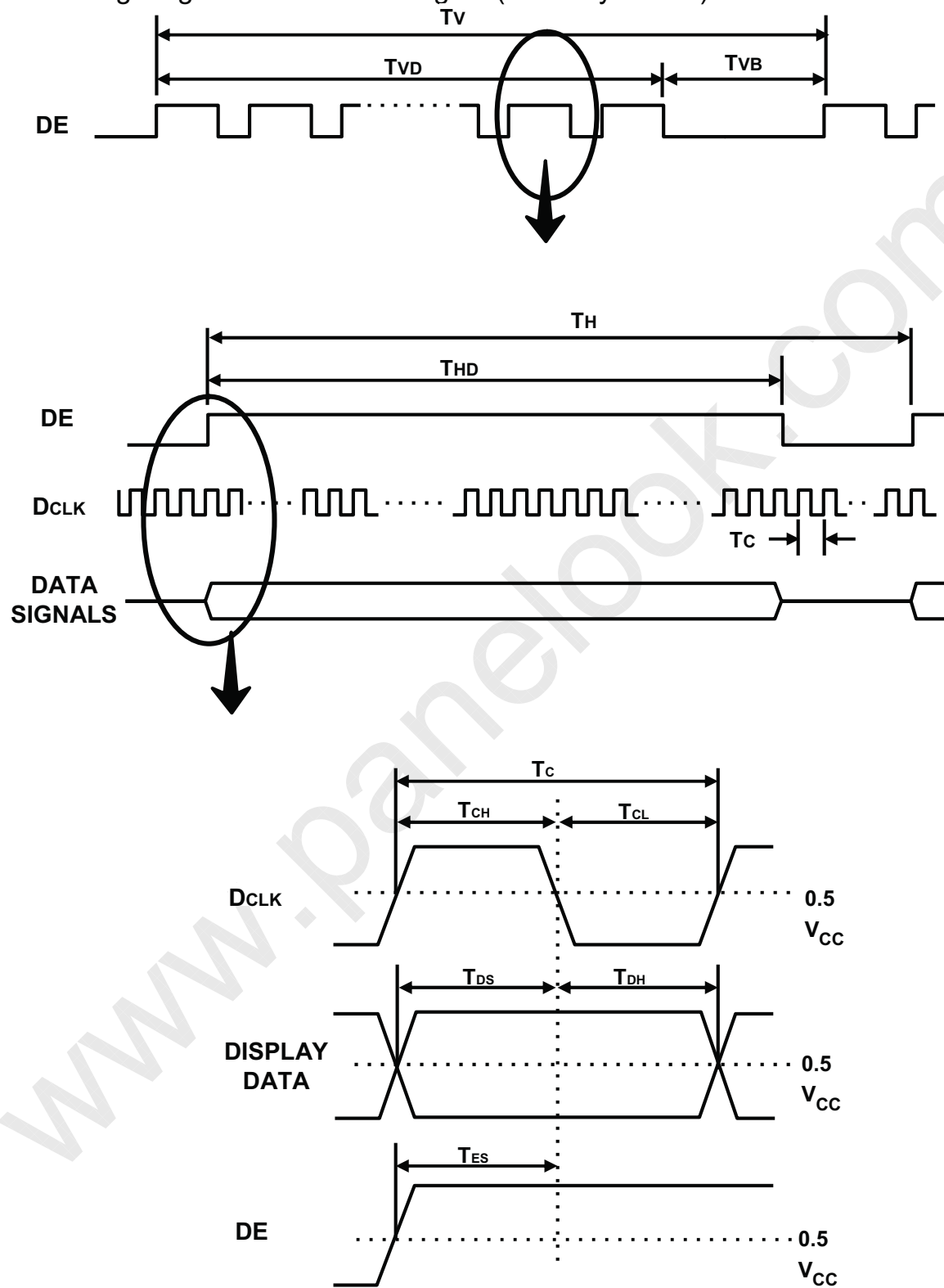
SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	72	78	85	MHz	-
Hsync		F_H	44	48	53	KHz	-
Vsync		F_V	48	60	66	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	768	-	lines	-
	Vertical Total	T_{VB}	776	802	1200	lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1366	-	clocks	-
	Horizontal Total	T_H	1460	1624	2000	clocks	-

Note (1) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

(2) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system

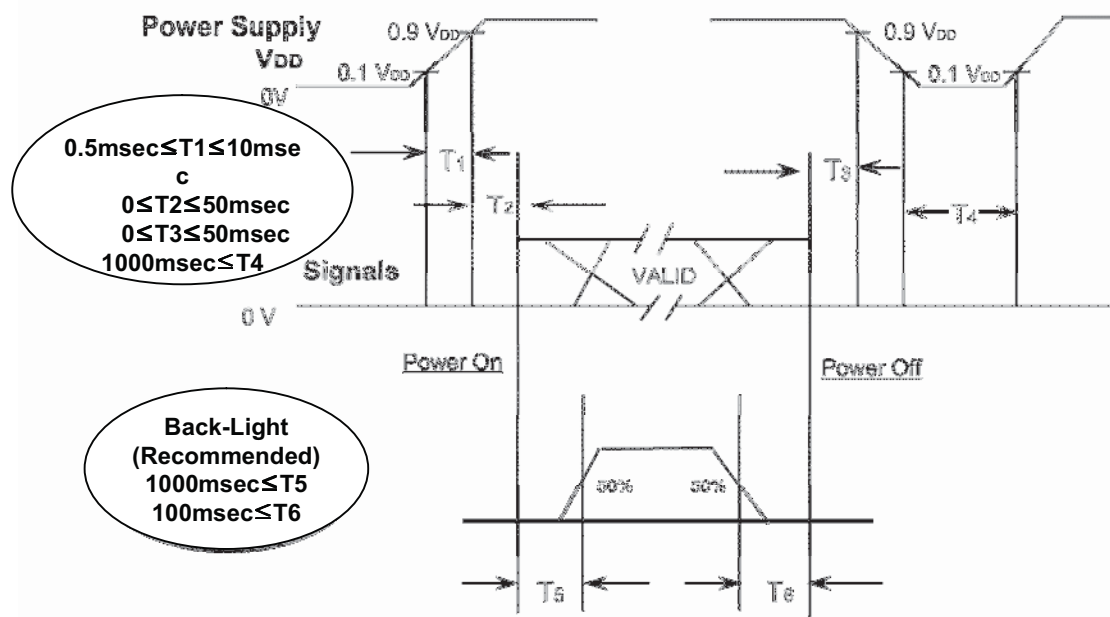
(3) Internal Vcc = 3.3V

6.2 Timing diagrams of interface signal (DE only mode)



6.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



T_1 : V_{DD} rising time from 10% to 90%

T_2 : The time from V_{DD} to valid data at power ON.

T_3 : The time from valid data off to V_{DD} off at power Off.

T_4 : V_{DD} off time for Windows restart

T_5 : The time from valid data to B/L enable at power ON.

T_6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD} .
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T_4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

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Technical drawing of a Samsung tablet showing front, back, and side views with dimensions and a table of general tolerances.

Front View Dimensions:

- Overall Width: 159 ±0.5
- Overall Height: 217 ±0.5
- Active Area Width: 323.712
- Active Area Height: 575.769
- Bezel Open Width: 328.840.5
- Bezel Open Height: 580.840.5
- Section A: 0.7 (Max 1.3), 1.8 (Max 2.7), 32 ±1

Back View Dimensions:

- Overall Width: 159 ±0.5
- Overall Height: 217 ±0.5
- Active Area Width: 323.712
- Active Area Height: 575.769
- Bezel Open Width: 328.840.5
- Bezel Open Height: 580.840.5

Side View Dimensions:

- Overall Thickness: 9.1
- Active Area Thickness: 25.12
- Bezel Open Thickness: 22.6

General Tolerance Table:

STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

Table Information:

REV	DATE	DESCRIPTION OF REVISION	CHK'D	REASON
1	09.11.24	S.Y. YUN		

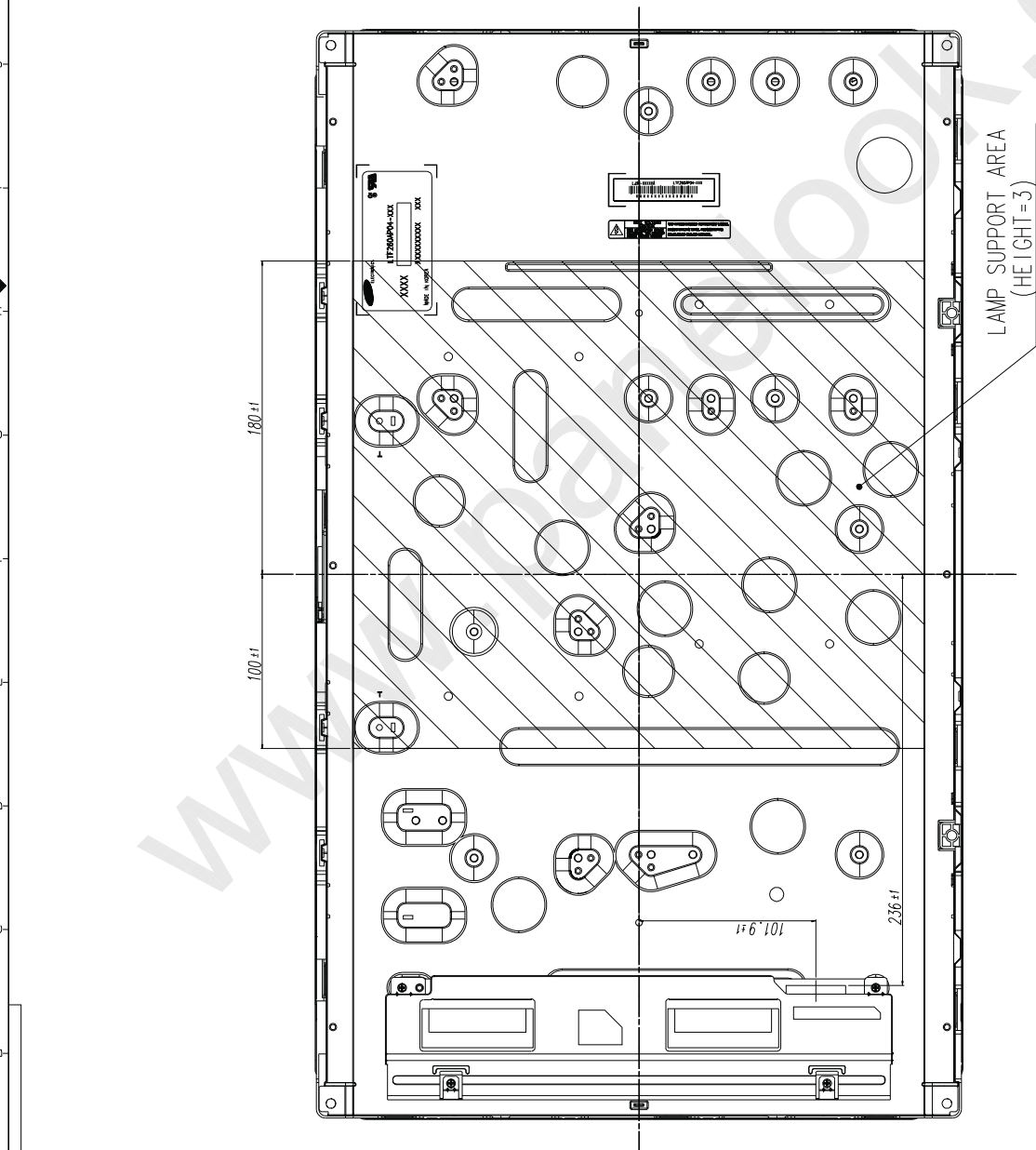
Part Information:

PART SHEET NAME	MODEL NAME	OUTLINE (FRONT)	CODE NO.
SAMSUNG ELECTRONICS			

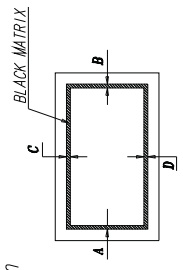
FILE NO.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99



* NOTE
1. BACKLIGHT : 4 COLD CATHODE FLUORESCENT LAMPS. (U-SHAPE)
2. INVERTER CONNECTOR SPECIFICATION.
- MAKER : JST
- PART NO.: S14B-PHA-SW3 (14P IN)
3. BLACK MATRIX SPEC
 $|A - B| \leq 2.0 \text{ mm}$
 $|C - D| \leq 2.0 \text{ mm}$



GENERAL		TOLERANCE		REV		DATE		DESCRIPTION OF REVISION		REASON		CHK'D BY	
STEP	LEVEL	LEVEL 1	LEVEL 2	LEVEL 3	UNIT	mm	mm	mm	mm	mm	mm	mm	mm
0 < X ≤ 4	±0.05	±0.1	±0.2	±0.3	SCALE	1/2	1/4	1/8	1/16	1/32	1/64	1/128	1/256
4 < X ≤ 16	±0.08	±0.15	±0.3	±0.5	COLLUMEN	S, Y, Y/M	09.11.24						
16 < X ≤ 64	±0.12	±0.25	±0.5	±0.8									
64 < X ≤ 256	±0.25	±0.4	±0.8	±1.0									

3406212593777

07063312 응용기술2파트 (LCD)1292123179 20091128121215

3406212593777

8. Reliability Test

Item	Test condition	Quantity
Temperature Step stress	-20℃ ~ 60℃ , 10Cycle, 80hr	4EA
HTOL	60℃ operation, 1000hr	8EA
LTOL	-5℃ operation, 1000hr	4EA
RTOL	25℃ , Continue~	4EA
HTS	70℃ storage, 500hr	4EA
LTS	-30℃ storage, 500hr	4EA
THB	40℃ / 95%RH 96Hr + Power on/off(5sec)	4EA
WHTS	60℃ / 75%RH, 500hr	4EA
Thermal Shock	-20℃ (30min) ~ 60℃ (30min) storage, 100cycle	4EA
ESD	contact : ± 8 kV , 150pF/330Ω , 210Point, 1 time/Point (operation) non-contact : ± 15 kV , 200pF/100Ω , 210Point, 1 time/Point (operation)	3EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	50G, 11msec, ± XYZ 1time/axis	3EA
PALLET Vibration	1.25Grms, Random, Z axis 3Hr	1PALLET(24EA)
PALLET Drop	31cm, 1degree, 3Edge(Bottom), 6Face(Bottom)	1PALLET(24EA)

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

- * HTOL/ LTOL : High/Low Temperature Operating Life
- ** THB : Temperature Humidity Bias
- *** HTS/LTS : High/Low Temperature Storage
- **** WHTS : Wet High Temperature Storage

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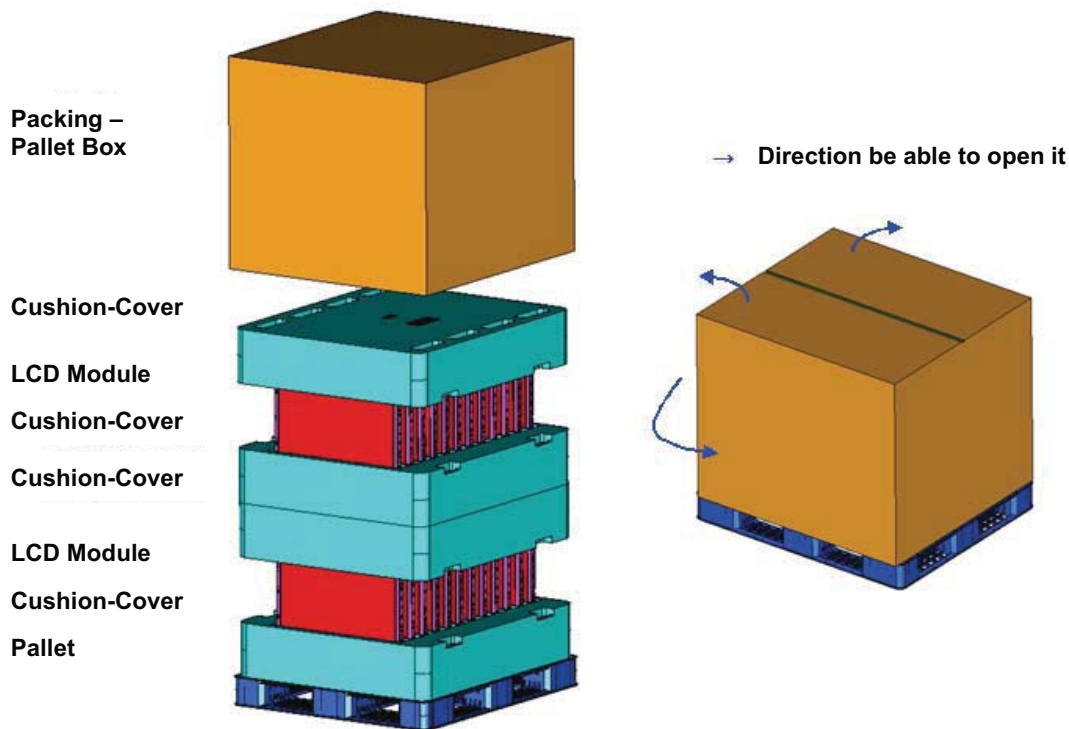
9. PACKING

9.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



9.2 Packing Specification

Item	Specification	Remark
LCD Packing	24 ea / Box (Packing-Pallet Box)	1. 4.2 kg / LCD (1 ea) 2. 2.7 kg / Cushion-Cover (1 ea) 3. 7.0 kg / Packing-Pallet Box (1 ea) 3. Cushion-Cover Material : EPS 4. Packing-Pallet Box Material : DW4
Pallet	1Box / Pallet	1. Pallet weight = 8.0 kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1150mm(H) x 985mm(V) x 1054mm(height)
Total Pallet Weight	126.6 kg	Pallet(8.0kg) + Cushion Cover (2.7kg x 4ea) + Module(4.2kg x 24ea) + Pallet-Box(7.0 kg)

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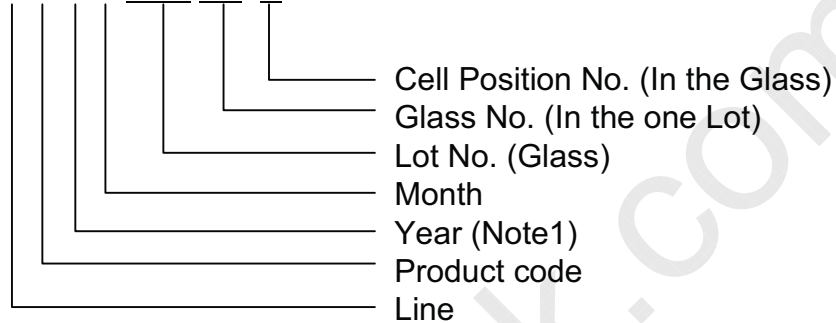
10. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

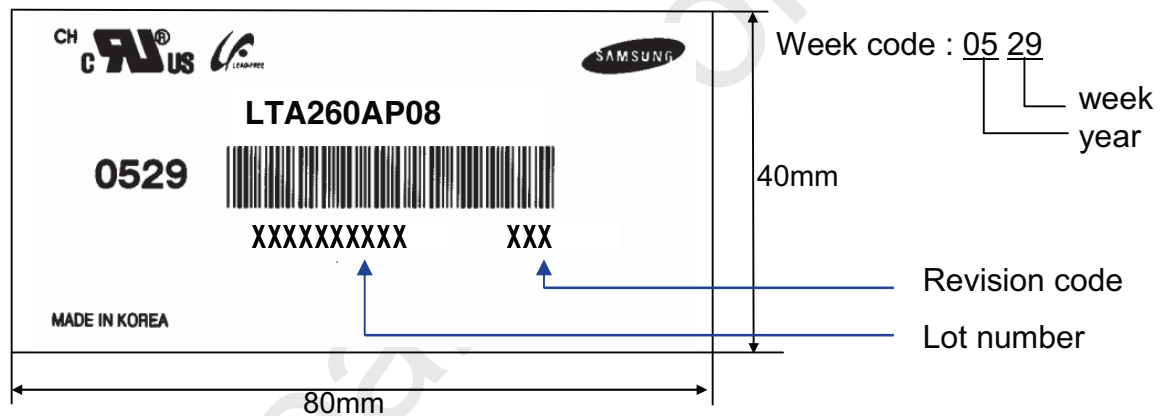
(1) Part number : **LTA260AP08-W**

(2) Revision: Three letters

(3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



(6) Others

1. After service part

Lamps cannot be replaced because of the narrow bezel structure.

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11. General Precautions

11.1 Handling

- (a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.
- (b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.
- (c) Refrain from strong mechanical shock and / or any force to the Module.
In addition to damage, this may cause improper operation or damage to the Module and CCFT back light.
- (d) Note that polarizers are very fragile and could be damage easily.
Do not press or scratch the surface harder than a HB pencil lead.
- (e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.
- (f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.
- (g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.
- (i) Protect the Module from static, or the CMOS Gate Array IC would be damaged.
- (j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (k) Do not disassemble the Module.
- (l) Do not pull or fold the lamp wire.
- (m) Do not adjust the variable resistor located on the Module.
- (n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (o) Pins of I/F connector should not be touched directly with bare hands.

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11.2 Storage

- (a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 0 to 35 °C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD Module in direct sunlight.
- (c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

11.3 Operation

- (a) Do not connect or disconnect the Module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the "Power on/off sequence"
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

11.4 Operation Condition Guide

- (a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
 - Temperature : $20 \pm 15^{\circ}\text{C}$
 - Humidity : $55 \pm 20\%$
 - Display pattern : continually changing pattern (Not stationary)
- (b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

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11.5 Others

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.
- (d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.
- (e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.
- (f) Please contact SEC in advance when you display the same pattern for a long time.

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